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Changing Major Acquisition Organizations to Adopt the Best Loci of Knowledge, Responsibilities and Decision Rights

30 September 2006

by

Dr. Mark Nissen, Associate Professor

Dr. Frank Barrett, Professor

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Naval Postgraduate School
Monterey, California

Colonel David A. Smarsh
President

Leonard A. Ferrari, Ph.D.
Provost

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The report was prepared by:

_____
Mark Nissen, Associate Professor
Graduate School of Business & Public Policy

_____
Frank Barrett, Professor
Graduate School of Business & Public Policy

Reviewed by:

_____
Robert N. Beck
Dean, Graduate School of Business & Public Policy

Released by:

_____
Dan C. Boger, Ph.D.
Acting Dean of Research

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The DoD is a large, bureaucratic, rule-intensive organization that may no longer be best suited for its new environment. Building upon prior, multidisciplinary research, we draw upon the best knowledge and practice in change management, and analyze transformation from the classic Hierarchy to the Edge-like Holonistic organization, which offers excellent potential for performance improvement. Such analysis focuses on the processes of change from one organizational form to another and leads to the generation of transformational plans, which can be used by acquisition leaders, practitioners and policy makers to outline steps—and leaps—required to affect fundamental organizational change. We also build upon prior work on computational modeling and experimentation to develop models of the transformation process, and we explore such models to emulate the behavior of the alternate transformational plans noted above. By modeling and experimenting with processes of change, as opposed to processes of ongoing organizational routines, we begin to extend the state-of–the-art in computational modeling and experimentation. Practically, answers to our research questions have direct and immediate application to acquisition leaders and policy makers. Theoretically, we generalize to broad classes of organizational transformations and prescribe a novel set of organizational redesign guides.

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Abstract

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Keywords: Acquisition, change management, computational modeling, organizational design, project management, qualitative methods.

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About the Authors

Mark Nissen, PhD, is an Associate Professor of Information Systems and Management at the Naval Postgraduate School. His research focuses on knowledge dynamics. He views work, technology and organizations as an integrated design problem and has concentrated recently on the phenomenology of knowledge flows. Mark's publications span information systems, project management, organization studies, knowledge management and related fields. In 2000, he received the Menneken Faculty Award for Excellence in Scientific Research, the top research award available to faculty at the Naval Postgraduate School. In 2001, he received a prestigious Young Investigator Grant Award from the Office of Naval Research for work on knowledge-flow theory. In 2002, he spent his sabbatical year at Stanford integrating knowledge-flow theory into agent-based tools for computational modeling. Before his information systems doctoral work at the University of Southern California, he acquired over a dozen years' management experience in the aerospace and electronics industries.

Mark Nissen, Ph.D.
Graduate School of Business and Public Policy
Naval Postgraduate School
Monterey, CA 93943-5000
Phone: 831-656-3570
Fax (831) 656-3407
e-mail: mnissen@nps.edu

Frank Barrett, PhD, is a Professor of Systems Management at the Naval Postgraduate School in Monterey, California, where he is also the Director of the Center for Positive Change. He received his BA in Government and International Relations from the University of Notre Dame, his MA in English from the University of Notre Dame, and his PhD in Organizational Behavior from Case Western Reserve University. He has also served on the faculty of The Katholieke University of Leuven in Belgium, Penn State University Behrend College, Case Western Reserve University, and Illinois Benedictine College. He has taught courses in Management, Organizational Behavior, Organizational Theory, Group Dynamics and Leadership, Organizational Design, Organizational Development, and Organizational Change.

Frank Barrett, Ph.D.
Graduate School of Business and Public Policy
Naval Postgraduate School
Monterey, CA 93943-5000
Phone: 831-656-2328
Fax (831) 656-3407
e-mail: fbarrett@nps.edu

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Executive Summary

The DoD is a large, bureaucratic, rule-intensive organization that may no longer be best suited for its new environment. Building upon prior, multidisciplinary research, we draw upon the best knowledge and practice in change management, and analyze transformation from the classic Hierarchy to the Edge-like Holonistic organization, which offers excellent potential for performance improvement. Such analysis focuses on the processes of change from one organizational form to another, and leads to the generation of transformational plans, which can be used by acquisition leaders, practitioners and policy makers to outline steps—and leaps—required to effect fundamental organizational change. We also build upon prior work on computational modeling and experimentation to develop models of the transformation process, and we explore such models to emulate the behavior of the alternate transformational plans noted above. By modeling and experimenting with processes of change, as opposed to processes of ongoing organizational routines, we begin to extend the state of the art in computational modeling and experimentation. Practically, answers to our research questions have direct and immediate application to acquisition leaders and policy makers. Theoretically, we generalize to broad classes of organizational transformations, and prescribe a novel set of organizational redesign guides.

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Introduction

Acquisition is big business. Drawing from Dillard and Nissen (2005) in this section, we note that the US Department of Defense (DoD) alone executes routinely eleven-figure budgets for research, development, procurement and support of weapon systems, for instance. Acquisition is also a rule-intensive business. In addition to myriad laws governing federal acquisition in the US, a plethora of regulations specify—in great detail often—how to accomplish the planning, review, execution and oversight of Government acquisition programs, large and small, sole-source and competitive, military and commercial (Dillard, 2003). Due in great part to the large size and many rules associated with Defense acquisition in particular, the organizations responsible for DoD acquisition activities tend to be large and rule-intensive themselves, reflecting the kinds of centralized, formalized, specialized and oversight-intensive forms corresponding to the classic Machine Bureaucracy from Organization Theory (e.g., see Mintzberg, 1979). Bureaucratic organizations are known well to excel in terms of efficiency when situated in stable, predictable environmental contexts, but this classic organizational structure is also known well to be exceptionally poor at anticipating and responding to change. In the context of military transformation, the associated problem should be clear and compelling: the Defense acquisition environment today is neither stable nor predictable.

Prior Research to Investigate this Problem

Prior research to investigate this problem (Dillard & Nissen, 2005) examined the *Hierarchy* with respect to two alternate organizational forms: *Decentralized* and *Holonistic,* which were identified theoretically to offer potential to improve the performance of Defense acquisition organizations. This empirical examination was conducted in two contrasting environments contexts: *Routine* and *Stressful*, which characterize the acquisition environments of yesterday and today, respectively. Using computational models of the Hierarchy and two alternate organizational forms, across the two contrasting environmental contexts, a 3x2 factorial experiment was

conducted to assess the relative performance of each organizational form and environmental context combination.

Table 1. Prior Experimental Results (adapted from Dillard & Nissen, 2005)

Measure	Typical Organization in Routine	Decentralized Organization in Routine	Holonistic Organization in Routine	Typical Organization Under Stress	Decentralized Organization Under Stress	Holonistic Organization Under Stress
Duration (dys)	556	428	407	580	604	458
Cost $K	$8,085	$4,674	$4,565	$8,561	$6,708	$4,973
Project Risk	0.41	0.54	0.76	0.37	0.55	0.76
Max Backlog (dys)	26	12	12	30	27	19
Work Volume (dys)	4800	4500	4500	4800	4500	4500
Rework Volume (dys)	124	866	465	401	2747	740
Coordination Volume (dys)	3051	423	742	3205	952	976
Decision Wait	20	54	0	67	186	0

Table 1 summarizes the prior experimental results for reference. The table includes measures for project duration, cost, risk, and other key dependent variables that provide insight into comparative organizational performance. The six columns represent each cell of the 3x2 factorial experiment. The first three cells summarize performance of the Hierarchy (labeled “Typical Organization”), Decentralized and Holonistic organizational forms in a Routine environmental context. Notice that both of the alternate organizational forms reflects shorter project schedules (i.e., measured by *duration*; 428 and 407 days for the Decentralized and Holonistic, respectively, vs. 556 for the Hierarchy) and lower project costs (i.e., measured in $K; $4674 and $4565 for the Decentralized and Holonistic, respectively, vs. $8085 for the Hierarchy) than the Hierarchy does. Alternatively, both alternate organizational forms reflect higher project risk (i.e., measured in terms of project exceptions that were either not reworked or not reworked completely (lower is better); 0.54 and 0.76 for the Decentralized and Holonistic, respectively, vs. 0.41 for the Hierarchy) than the Hierarchy does. Hence, one can observe a seemingly fundamental tension between project speed and cost versus risk (see Nissen & Buettner, 2004), a tension that requires either explicit or implicit tradeoffs to be made by leaders and policy makers interested in the performance of acquisition organizations.

The next three cells summarize performance of these same three organizational forms in a Stressful environmental context. Notice first that, in terms of project duration and cost, all three organizational forms perform worse under environmental stress than they do in a routine environment, but that project risk does not change appreciably between the two contrasting environmental contexts. Hence, all three organizational forms appear to be quite sensitive to stress in terms of schedule and cost, but appear also to be relatively robust to stress in terms of risk. One can see how this prior research is elucidating the relative, contingent characteristics of alternate acquisition organizational forms and environmental contexts.

Notice second that, as above in the routine environmental context, both of the alternate organizational forms reflects lower project costs ($6708 and $4973 vs. $8561) and higher project risk (0.55 and 0.76 vs. 0.37) than the Hierarchy does. However, in contrast with the former results, schedule performance by the Decentralized organization is worse than that of the Hierarchy (604 vs. 580 days); yet, the Holonistic organization maintains relatively good schedule performance (458 days). Not only does the Holonistic organization outperform its Hierarchy and Decentralized counterparts in terms of project duration and cost, this form appears to be the most robust to environmental stress, as the effect of such stress on its relative performance is much smaller than on the relative performance of the other two organizational forms.

To summarize, the seemingly fundamental tension between project speed and cost-versus-risk persists across contrasting environmental contexts, and necessitates either explicit or implicit tradeoffs to be made by leaders and policy makers interested in the performance of acquisition organizations. Plus, the three organizational forms react differently to environmental stress, which necessitates another set of tradeoffs to be made—explicitly or implicitly. As such, acquisition leaders and policy makers have new knowledge about contingent relationships between alternate organizational forms and their relative performance across contrasting environmental contexts. Such knowledge enables a new—or at least

previously unrecognized or ignored—capability to *design*, or more appropriately to *redesign*, organizations to perform better in the changing acquisition environment of today and tomorrow.

Moreover, because such leaders and policy makers retain considerable control over organizational designs, the associated transformation from one organizational form (esp. the Hierarchy) to another (e.g., Decentralized or Holonistic) can be affected largely without reliance upon new regulations or legislation. In combination with acquisition reforms that have been ongoing for a decade or more, this provides seemingly unprecedented power to acquisition leaders and policy makers to improve the performance of the organizations in their charge. Notwithstanding such new knowledge, capability and power, however, *knowing what* organizational design is most likely to perform best in a given environmental context does not imply that *knowing how* to accomplish the required redesign will follow. Indeed, the question, how to change major acquisition organizations to adopt the best loci of knowledge, responsibilities and decision rights, is more difficult than—yet follows directly from—the question above concerning which organizational form to select. This latter "knowing how" question is addressed through research described in the present article.

Present Research to Address Organizational Redesign

Building upon the prior research summarized above, we draw upon the best knowledge and practice in change management (e.g., including models of planned change, change typologies, large-scale change, and sense-making) to analyze transformation from the classic Hierarchy to the two organizational forms (*Decentralized* and *Holonistic)* in the acquisition domain. As suggested above, such analysis focuses on the *processes of change* from one organizational form to another and leads to the generation of transformational plans—involving both radical and incremental means—which can be used by acquisition leaders, practitioners and policy makers to outline steps—and leaps—required to affect fundamental organizational change.

We also build upon prior work on computational modeling and experimentation to develop a preliminary model of the transformation process. With further model development, exploration and refinement, we hope to utilize such a model to emulate the behavior of the alternate transformational plans noted above. By modeling and experimenting with processes of change, as opposed to processes of ongoing organizational routines, we can extend the state-of-the-art in computational modeling and experimentation. Practically, answers to our research questions have direct and immediate application to acquisition leaders and policy makers. Theoretically, we generalize to broad classes of organizational transformations and prescribe a novel set of organizational redesign guides.

With this research agenda expressed, the balance of the article begins with description of the three-part research design. We then articulate the qualitative research findings, and follow with relatively in-depth discussion of planned change. A preliminary, computational model of one change process follows in turn. The article closes with key conclusions, implications for practice, and topics for future research to continue building upon this investigation.

Research Design

This discussion of the research design is organized into three parts: 1) qualitative inquiry, 2) theoretical analysis, and 3) computational experimentation. This integration of three, distinct research methods enables a degree of empirical grounding, theoretical synthesis, experimental control and triangulation that would be difficult, if not impossible, to achieve otherwise. Each part is discussed in turn.

Qualitative Inquiry

We undertake a qualitative research study to investigate the deep meaning associated with managing acquisition organizations, and to draw directly upon the experiences of veteran acquisition managers. The major portion of this study is conducted by a team of PhD students working under supervision of the authors. We acknowledge their helpful contribution here. The emphasis of this qualitative

fieldwork is upon project managers, who offer insight into conditions that signal organizational change, and into reactions to such conditions. Grounded theory building along the lines of Glaser and Strauss (1967) provides the key methodological guide for the study, with heavy utilization of interviews guided in large part by Rubin and Rubin (1995). The two, interrelated research questions addressed through this fieldwork are: 1) how does the acquisition manager know when change is needed? and 2) what are the enablers and obstacles to create successful organizational change? Clearly such fieldwork supports the overall focus of the research described in this article, and such qualitative analysis complements well the other methods employed.

This summary of the qualitative research method draws heavily from and synthesizes the ideas of Bourazanis (2005), Bush (2005), Gateau (2005) and Mirano (2005). The students interviewed four experts in the field of acquisition. All four had acquired significant program management and acquisition experience, as well as operational military experience. All were retired, senior, US military officers, including two Army Colonels, an Air Force Lieutenant Colonel and a Navy Commander. This provides a basis for comparison across three US Military services, yet focuses on experienced, senior professionals. Their status as retired military officers introduces a somewhat rarefied perspective into the study, as their first-hand acquisition experiences took place several years in the past. However, each informant indicated vivid recall of the past events, and confirmed ongoing understanding of events and changes in the acquisition field since retirement. Indeed, all four informants serve currently as acquisition faculty members whose primary professional purpose involves staying current in the acquisition field.

The four interviewers worked collaboratively to develop a common, semi-structured protocol with ample opportunities for probing, snowballing and follow-up. Each interview lasted roughly sixty minutes and was recorded and transcribed. Each of the four students transcribed, coded and analyzed one of the four interviews independently, but the four interview transcripts were pooled for use by all four students. Hence, each student had access to, and conducted his analysis across, all

four interview transcripts; yet, each student produced his own, independent paper from these qualitative data. The authors of this present article also read through the four interview transcripts, as well as the student papers, and developed their own, synthesized interpretation by treating the student syntheses as secondary data.

Theoretical Analysis

Theoretical analysis represents the centerpiece of this article as we draw from the change literature—broadly defined—to address the "how to change" question posed above. This theoretical analysis is framed to complement the qualitative results, and focused to help guide computational model development. As such, it represents a metaphorical fulcrum, which leverages qualitative research on one side against computational experimentation on the other. Mixing metaphors, we *sandwich* theoretical analysis between two empirical studies: qualitative results that have been analyzed and computational experimentation yet to be accomplished.

Computational Experimentation

We undertake a study based upon computational experimentation, which builds directly upon prior work along such lines by Nissen and Levitt (2004) and Dillard and Nissen (2005). As highlighted first by Nissen and Buettner (2004), computational experimentation bridges the chasm between analytical and laboratory methods on the one side—which are powerful in terms of control, but suffer from problems with external validity and generalizability—and field methods on the other side—which are powerful in terms of realism, but suffer from problems with internal validity and reliability. Particularly when integrated with other research methods, computational experimentation provides a powerful approach to addressing difficult questions pertaining to organizations.

Our key departure in this present research pertains to the object of our modeling and experimentation. Whereas previous computational modeling and experimentation have focused on the structures and behaviors of organizations and their operational processes, the focus here is on the processes of change. Clearly

organizations and their processes are involved in change models too, but the nature of such organizations during change is likely to differ in key respects from those not undergoing change, and the processes associated with change will clearly differ from those involved with routine operations. As an illustrative example, a classical manufacturing firm (e.g., US automobile company) would be modeled to represent the structure and behavior of its bureaucratic organization and assembly processes. But this same firm, when undergoing change, might be modeled instead to represent the structure and behavior of a cross-functional, ad-hoc change team and processes of organizational redesign and resistance mitigation.

The computational modeling and experimentation draw heavily upon the stream of work associated with the Virtual Design Team (VDT) Research Program (VDT, 2006), which has been described in considerable detail elsewhere (e.g., see Jin & Levitt, 1996; Kunz et al., 1998; Levitt, et al. 1999), and adapted specifically to the acquisition domain by Dillard and Nissen (2005). Adopting the VDT paradigm brings to bear nearly two decades of research which integrates well-accepted organization theory (e.g., Galbraith, 1977; March & Simon, 1958) with extensive empirical validation projects (e.g., Christiansen, 1993; Thomsen, 1998), and which has demonstrated excellent representational fidelity and both qualitative and quantitative validity in terms of operational organizations in practice. This VDT paradigm also brings with it a well-refined and validated tool set for modeling the structures and emulating the behaviors of operational organizations.

In this study, we draw both from the qualitative fieldwork and, in particular, the theoretical analysis to identify candidate change organizations and processes to model. This effort remains highly exploratory, as computational modeling of change organizations and processes pushes the state-of-the-art. Indeed, it remains highly speculative even whether the VDT computational modeling suite of methods and tools can be used to represent and emulate the respective structures and behaviors or change organizations and processes.

Qualitative Findings

To re-iterate from above, the qualitative inquiry sought to answer two, interrelated research questions: 1) How does the acquisition manager know when change is needed? and 2) What are the enablers and obstacles to create successful organizational change? Addressing this first question first, the prevalent case suggests that the acquisition manager does not recognize the need for *organizational* change. Admittedly, the multiple interviews did reveal a common disdain for "the system" and its many constraints. For instance, we learn from one study that acquisition managers feel the "need to fix the program or at least make it look like [they're] going to fix it." The interviews reveal also that acquisition managers take an action-oriented approach. For instance, one study reports that acquisition managers will try new techniques: "He was the first program manager to embrace integrated product teams (IPTs) and integrated product and process development."

But the nature of changes undertaken by acquisition managers in the study fell far short of the kinds of *organization* changes that are noted in the literature and emphasized in this study. Indeed, one study reports that "change for change's sake" was common, and another states that "[w]hat the subjects, themselves, referred to as change, was very often not an actual change." Indeed, we find reports of signaling change (e.g., through superficial re-organization) playing a larger role than change itself does (e.g., "reorganizations *look like* change"). Further, "[t]he majority of changes reported by the interviewees were in some way exogenous"; that is, change in its dominant form was imposed from above via hierarchical fiat. Hence, external authorities appear able to affect some kind of change upon acquisition organizations (e.g., via laws and regulations), but the organizations themselves appear unable to affect such change. This serves to reinforce our focus on the change process itself as a route toward change without reliance upon legal and regulatory authority, a route taken sparingly by previous researchers in this domain.

Addressing the second question reveals many of the enablers and obstacles to creating successful organizational change that are known well via both theoretical

and empirical research on the topic. For instance, the hierarchical organizational form itself tends to resist change, and such resistance is noted in one of the studies as “constraints on innovation imposed by the military hierarchy.” As another instance, the bureaucratic nature of the acquisition organization hierarchy limits the power of acquisition managers: “one of the greatest challenges that a program manager is facing is the civilian personnel and civil service—the ability to fire people, the ability to hire the right people.”

We also find risk aversion as another induced attribute of change resistance that is noted often in the literature: “one bad choice is likely to result in significant repercussions, both personally for the change agent and for the program. […] This drives decision makers to look for the lowest-risk option […] [which] quite often means not changing at all.” Internal organizational problems surface through our studies as well. For instance, “the lack of coordination among the IPT leaders led to [a] waste of time and undermined the reputation of the acquisition organization as well.” This suggests also a contingency problem of *fit* (see Burton & Obel, 2004) between the hierarchical form of acquisition organizations and their ability to change; and it begins to elucidate the insidious and constraining nature of the hierarchy: not only does it represent an organizational form that is unsuited in several respects for its current, dynamic environment, but this form resists change to other forms. Introducing some anthropomorphication here, one could say that the hierarchy is *stubborn*.

Additionally, we find an apparent absence of foresight among acquisition managers that corresponds well to the change literature we explore below. More specifically, this is consistent with the assumptions from the Carnegie model of decision making and, as we show, suggests that beginning with engineering-focused interventions may be self-limiting. For instance, we discover from one study that most acquisition managers “seemed not to be looking for an ideal solution, instead either choosing a solution from the ‘toolbox’ or adopting a non-ideal […] solution.” More than one study suggests that acquisition managers—project managers in particular—may possess a unique set of capabilities and dispositions, as terms such

as *overly optimistic* appear throughout. Indeed, we find considerable evidence that acquisition managers possess and defend a very strong sense of *identity*: a set of norms, beliefs and reflexive perceptions that guide both understanding and behavior. Even as organizational change is mandated from above, this strong identity prevents substantive change from within, and the organizational form itself exacerbates the situation, as acquisition managers are relegated to "doing what they can," and to applying "known good solutions (in other situations) to the existing problem." This presents us with something of a paradox: *the acquisition organization manifests a need to change form, but its very form inhibits such change*.

Alternatively, the studies reveal some potential avenues for change also. For instance, within the *toolbox* notion from above, we find that acquisition organizations do change—at least superficially—with some regularity, "moving between established organizational repertoires." We also learn about "administrative effort, refocus and 'change for change's sake' that ensued with each leadership turnover." Apparently, the tenure of a typical acquisition manager is relatively short, and, hence, acquisition managers tend to change positions relatively frequently. With each such leadership change comes an opportunity for organizational change. Further, changes with exogenous impetus appear to be accepted with relative ease by the acquisition organization: such "changes are generally adopted and acted upon with little significant resistance." Thus, the qualitative results suggest that established organizational repertoires may provide feasible avenues for change. Perhaps the acquisition organization can *be taught* novel routines to add to such repertoires. Also, each seemingly frequent leadership change could be combined with broader, more systematic efforts to redesign the acquisition organization from within. As above, however, the current set of acquisition managers may not have requisite knowledge to affect such internal redesign, and their strong sense of identity may preclude them from committing to the kind of transformational, internal change required. The challenge then is formidable. Clearly, if DoD acquisition organizations are going to change to the degree and depth that managers envision is needed, it will constitute nothing less than a change in the collective identity of the

organization(s). Identity change is a topic we return to below when we consider change models and interventions.

Clearly, we must reach beyond the qualitative data and inductions discussed here and draw from theory to understand *how* such three points could be integrated. Further, we must reach in turn beyond such theory, and pursue a program of empirical comparison to assess the relative advantages and disadvantages of this and other approaches to changing the acquisition organization fundamentally. The next two sections summarize such theoretical and empirical reaching.

Planned Change

The qualitative findings above suggest that perhaps the field of organizational change can shed some light on the challenge facing Acquisition Organizations. This focused review of the change literature relevant to our study is organized into five parts: 1) Models of Planned Change, 2) Change Typologies and Planning the Flow of intervention types, 3) Intervention Models within DoD, 4) Sense-making as a tool to understand change processes, and 5) the Logic for beginning with socializing interventions and Large-scale Change.

Models of Planned Change

As many have noted, planned change is usually initiated because of the need for an organization to adapt. Representations and typologies depicting change approaches vary. Some emphasize the level of planned change as first or second order (Bartunek & Moch, 1987); some emphasize degree of change (incremental or radical); others emphasize the target of planned change; others the pace of change or the tempo of change (episodic or continuous). First, we investigate the kind of change involved in moving an acquisition organization from bureaucratic to holonistic, or what we are calling “power to the edge” (see Alberts & Hayes, 2003), using Dunphy’s (1997) typology. This helps us appreciate the radical nature of change. It also provides a logic for why it is necessary to focus on the theory underlying the intervention (in this case, the nature of sense-making as a way to

understand human behavior during radical change), and finally, the logic for why socializing interventions and large group interventions are appropriate because they tend to account for the nature of sense-making in cases such as the one we are exploring.

Dunphy suggests that any theory of change must account for five components: 1) basic metaphor of the organization; 2) analytic framework; 3) ideal model; 4) intervention theory; and 5) role of change agent. We explore these components and consider how they apply to the case of changing from bureaucracy to holonistic, or “edge-like” organizations. Dunphy suggests that any change intervention must account for: 1) a basic metaphor of the nature of organization; 2) an analytic framework or diagnostic model to understand the change process; 3) an ideal model of an effective organization that includes targeted outcomes; 4) an intervention theory that specifies where, when and how to intervene; 5) a definition of the role of the change agents.

Change in the basic metaphor of the organization: from centralized power to “edge” power. The bureaucratic metaphor sees organization as predictable, relying on patterned routines; change is infrequent and driven from the top; interdependence is usually sequential and coordination occurs through plans. The holonistic metaphor envisions an organization that is emergent, self-organizing; people are empowered to make decisions based on knowledge and expertise rather than by authority position; change is constant, evolving, and cumulative. Interdependence is often reciprocal, and coordination occurs through negotiation.

Change in analytic framework. Bureaucracies seek equilibrium, so change is seen as an occasional interruption or divergence. Changes are often driven externally and often seen as a failure to adapt. Adaptations tend to be short run and scope tends to be macro or global. In holonistic organizations, change is seen as an endless modification in work processes and social practice driven by alert reactions to daily contingencies; small accommodations cumulate and amplify. Change efforts

emphasize long-run adaptability at the micro level. The key change is redistribution of decision rights and expertise to the edge of organization.

Ideal Model of effective organization: the ideal model of the mechanistic organization is one of efficiency and predictability, hierarchically ordered, in which planning and decisions occur at the strategic apex and are implemented at lower levels. The holonistic organization is one in which power is distributed to the edge; individuals are able to "sense and respond," are empowered to initiate actions and changes when the situation arises. As a result, this organization is capable of continued adaptation.

Intervention theory: A bureaucratic acquisition organization is rule-driven and seeks to minimize disruptions. This tends to be consistent with a model of "punctuated equilibrium." In a holonistic organization, change is continuous (Van de Ven & Poole, 1995). Executives are encouraged to notice instability, disorder, novelty, emergence, and self-organization for their innovative potential rather than as something to be avoided, eliminated, or controlled. This approach to change tends to be consistent with complexity theory in which the unexpected and unknown are resources for novel action, a responsive organization that operates at the "edge of chaos." Rather than change perceived as something that must be anticipated, planned, and controlled, change is anticipated, unplanned and facilitated. Also, agents are richly connected (rather than functionally separated), and feedback is non-linear (rather than exclusively guided by chain-of-command norms). This last observation should be enough to signal that this is indeed a radical change that challenges habitual sense-making norms. (For this reason, below we explore in more detail traditional decision making theory that informs DoD bureaucracies and the need to understand the process of sense-making as a guide to choosing interventions that align with theories of sense-making).

Role of Change agent: Traditional acquisition organizations in which change is planned and occasional, change agents tend to be located in positions of hierarchical power. The change agent is seen as a prime mover who plans and

directs, communicates action plans, builds coordination. In holonistic organizations (in which power is distributed), change agents are sense-makers who redirect the flow of change, focus on changes in the margins, facilitated improvisation, responsiveness, and learning.

By exploring each of these 5 components, we can see more clearly that the proposed change in DoD acquisition organizations is, in fact, radical along each of the dimensions. For our purposes, we explore in more detail below the change in intervention theory that is involved. Therefore, we begin by exploring a range of change typologies.

Change Typologies

One of the most enduring typologies of organizational change is the one proposed by Van de Ven and Poole (1995). They explore four basic process theories of change and posit different event sequences and generative mechanisms: 1) lifecycle theories, 2) teleological theories, 3) dialectical theories, and 4) evolutionary theories. By definition, planned change approaches are teleological. Huy (2001) further elaborates the teleological model by outlining four different engines (or intervention theories) and, correspondingly, different kinds of change agents that are called for: 1) commanding approaches which are directed toward formal work structures; 2) engineering approaches directed towards work processes and job design; 3) teaching approaches that are directed toward beliefs; and 4) socializing approaches directed toward social relationships. These are ideal type models, and most large-scale change efforts involve combinations, if not inclusion, of all four intervention approaches. Therefore, we also seek to understand the importance of the order and combination of these approaches as we apply these types to DoD organizations.

Commanding Interventions: are aimed at changes in formal structures. Much of the strategic management literature assumes a commanding change model. Change agents tend to take on the role of commander engaging in activities like strategic planning, competitive analyses, and portfolio management. These

efforts are traditionally directed by “top team.” Efforts are directed to get the rest of the organization to comply with the dominant coalition’s plans. This is an appropriate mode when change targets are tangible (Theory E), such as changing people, downsizing, restructuring. This is not the kind of approach that would be successful if the goal was to change beliefs or values. When change needs to be quick and produce an immediate effect, commanding approaches are appropriate. As we hinted earlier and explore more fully below, commanding interventions are almost always the initial model in DoD systems.

Engineering Interventions: tend to be focused on work processes. Re-engineering efforts, total quality efforts, socio-technical and job-design changes are engineering interventions. They include efforts to redesign business processes; efforts directed at cost, quality, service and speed are engineering interventions. Change agents tend to focus on analyzing detailed work specifications and redesigning work processes to improve quality of production. Change targets are seen as rational (motivated by economic self-interest). Change agents tend to be task analysts who diagnose work processes and organizational designs. In engineering intervention, efficiency is the most important goal.

Teaching interventions: tend to be focused on changing beliefs. This often involves teaching about ideas, values, points of view, how to motivate people, decision-making capacity, awareness of mental models, similar to what Chin and Benne called a normative-re-educative method. Efforts are made to uncover participants’ values and beliefs. Much of this work is cognition based; targets are often cognitive dysfunctions and culture change. Change agents tend to have a-priori models. (As we explore more fully below, teaching holonistic organizing principles to people in DoD organizations is a sizable challenge).

Socializing interventions: Socializing interventions pertain to changes in social relationships and involve power distribution and alterations in decision-making patterns. Examples of socializing interventions include team building and semi-autonomous work groups. The assumption here is that changes in roles and

behaviors precede changes in beliefs. Following socio-technical systems theory, the assumption is that social learning processes occur mostly within groups. Most of these interventions are efforts to create semi-autonomous work groups; empowered decision-making in an effort to adapt to unpredictable environments or changing circumstances; to permit decisions to be made at the point where action is needed (as opposed to referring decisions to others who have authority but lack intimate knowledge of problems needing to be addressed). Change agents tend to be facilitators and coaches.

As we look at the effort to change from Bureaucratic to Decentralized or Holonistic organization, it is clear that this is a teleological, goal-directed change; it can be argued that all four of the intervention models above are needed. It is also important to consider what combinations and which order of intervention models should be deployed. Acquisition organizations will not change unless commanders set direction and vision, describe and communicate clearly necessity for change, determine formal organizational arrangements that should be target for change and which elements are off limits; and analyze environmental impacts (commanding intervention). Decentralized or holonistic organization will certainly involve a detailed analyses of work specifications, and a redesign in work processes (engineering interventions). Such a radical transformation will involve different beliefs, values, motivators for participants; new skills will need to be developed to aid in decision-making capabilities and team development (teaching interventions). Relational patterns and modes of interdependence will certainly be altered (socializing interventions).

Intervention Models within DoD

While all successful change efforts tend to favor one of the above models for change, they tend to require combinations of the intervention models, if not all four. The question emerges: what is the most appropriate change model for moving acquisition organization from bureaucratic to power-dispersed? The DoD usually leads with command, teaching, and engineering interventions. Unfortunately, these interventions are not up to the task of the kind of pervasive change needed to move

toward edge-like structures, in which decision rights are distributed to various actors. One of the reasons that engineering interventions do not work is that they are based on quasi-rationalistic models of decision making. Such models of decision making are appropriate when goals are clear and tasks are stable. This is not the case in holonistic structures, and is not the case during transition to edge-like structures.

In order to understand how humans behave under conditions of discontinuous change and flux, we need a different model of decision-making and action. Here we review common approaches to decision-making and explore the concept of sense-making. We argue that what sense-making theories allow us to see is how people attempt to create meaning and order out of equivocal experiences; sense-making processes involve retrospective efforts, involve social processes, and depend upon notions of identity maintenance and construction. Because edge-like transformations are radical and will require multiple efforts of sense-making, we then ask an important question: what is the best intervention to enhance sense-making capacity in a way that guides actors to act in edge-like manner? We argue that skills in sense-making processes are best developed and managed within the context of socialization interventions.

In this section, we argue that the proper “order” of change interventions should be: commanding, teaching, socialization, and finally, engineering. The most important part of our argument is the proposal that socialization is a necessary mode of intervention because of the depth and pervasiveness of change and sense-making necessary to become an edge-like organization. We also demonstrate that a change process using socialization methods, while most promising, is also more costly in terms of time and resources.

Traditional models of interventions in DoD organizations: Here we discuss the traditional model of change intervention utilized in DoD efforts. Most change interventions within the DoD begin with commanding interventions and are followed by teaching and engineering interventions. Recall that command interventions are changes in structure. In DoD organizations, leaders frequently announce changes in

organizational structure, changes in reporting relationships. These efforts from the top are teaching interventions that propose new metaphors, such as “budgets are battles to be won,” cost control helps to “win the war on terror,” for example. These are then followed by engineering interventions—efforts to streamline processes. There are other familiar examples of DoD command interventions and teaching interventions followed by engineering interventions. The Total Quality Management Movement in the 80’s and the Business Process Re-engineering Movement in the 90’s provide myriad examples of such engineering interventions. It is usually the engineering interventions that count as “real” change in DoD because they are measurable; and it is here that work processes change. It is worthwhile exploring the limitations of focusing on engineering interventions when changes in identity are called for.

The problem with engineering interventions in the context of radical change:

Engineering models assume that individual decision making is rational in orientation; that problem identification is clear, that there is access to alternatives and that viable problem solutions can be attained; that decisions can be programmed, that is, that repetitive, well-defined procedures exist to find a solution to analyzable tasks. An engineering model of change tends to assume a view of people as rational, economic actors, people who have extensive information and rich frames to guide decision-making and action.

The engineering model of intervention that assumes the rational mode of decision-making is optimal when goals are clear. Rational choice models of behavior and engineering-focused interventions are appropriate when evaluating problems in relation to stable goals, when actions are chosen from various sets of alternatives. Accurate information and accurate perception are especially important in these models for evaluating the feasibility of alternatives. However, a DoD organization moving toward an edge model does not fit this conception; goals are emergent and transient. We are more likely to encounter an amorphous flux of activity that must be bracketed as meaningful and relevant before any action alternatives emerge. Further, we imagine that managers in edge climates will be faced with several

problems, interpretations, action scenarios simultaneously. In these conditions, accuracy of perception might not be as important as creating a credible interpretation or narrative. What's needed is the capacity to make sense of situations in a way that coordinates action and moves the organization forward in desired ways.

The point here is that engineering interventions, legitimized by rational and analytic tools, are appropriate only after change to an edge-like climate has occurred. During the process of transition, engineering methods are likely to escalate commitment to an undesired course of action and "refreeze" behavior too soon.

Efforts to modify rational decision making models—the Carnegie Model:

There have been several attempts to modify the rational decision making model, in particular the March and Simon, or Carnegie model. March and Simon challenged this model of decision making—most situations in organizations are non-programmed; that is, situations are novel, poorly defined, and no procedure exists for finding a solution. This "bounded rationality" perspective assumes that people have limited time, information, and resources, that organizational and social constraints limit the potential for fully rational solutions. The Carnegie model of decision making assumes that constraints create conditions of bounded rationality, that there is usually disagreement about goals and priorities, that decision making is political, that managers form coalitions and, through political processes, arrive at goals and priorities; and satisfice (that is, look around for quick solutions in the immediate, local environment rather than searching for the optimal solution) rather than optimize.

The March and Simon framework emphasizes habit in explaining choice-making and behaviors. This helps to explain the persistence of behaviors and routines, but does not address the initiation of new behaviors. It helps to explain when and how engineering interventions are appropriate, too. But because such a bounded rationality model does not focus on the process that surrounds bounded

rationality, it is not useful for understanding the dynamics of radical change, for understanding how people adjust to radically changing circumstances. Also, it is limited to individual frames of reference, and does not account for the process by which choices are considered and made. This would require accounting for the larger social processes. Hence, although the bounded rationality model reflects improvement over the engineering approach that is common to DoD change, it too is inadequate in helping us understand the kinds of change required to transform into Edge-like, Holonistic organizations. To better understand how people respond to change within the context of social groups, we must turn to the model of sense-making.

Sense Making as a Tool to Understand Change Processes

One heuristic for understanding human behavior when actors are thrown into the flux of everyday events, making sense of changing context, is to explore the concept of sense-making. Sense-making refers to how people structure the unknown and is a useful framework for making sense of organizational change (Mills, 2003). Following Weick, "people make sense of things by seeing a world on which they have already imposed what they believe." Sense-making is not a body of theory, but a recipe for analysis (Weick, 1995), a site where people construct meaning, constrain action, and construct identity.

Sense-making is explicit and "visible" under conditions of surprise and unmet expectations, when events are perceived to be different from what was expected; or when the meaning of events is so unclear that actors do not know how to engage the world. In these moments, there is a shift from what Heidegger called the "ready to hand" mode, in which one is coping or immersed in the flow of events, to the "unready to hand mode," in which action is disrupted and people must reflect or introspect to access reasons for engaging. The scripts and rationales that people look for in attempting to re-engage the world are drawn from organizational and institutional settings, past routines, plans and procedures. Following Mills, a sense-making framework "can be used to explain how/why particular change programmes are adopted in the face of evidence of their shortcomings, and why, despite every

effort, some managers unilaterally reject such attempts at change" (p. 50). One of the reasons that a sense-making framework is useful in this project is that we are seeking to understand how acquisition professionals will act under proposals for radical change. Sense-making theory proposes that they will draw upon organizational settings and past routines, familiar plans and procedures to make sense of novel stimuli as a way to move forward. It is a useful framework to understand how knowledge unfolds piecemeal as people attempt to coordinate and circulate information.

For our purposes, we would like to draw out two of the essential properties of sense-making—identity construction and the social nature of sense-making. Within the ongoing stream of activity, people begin to notice and bracket; they carve cues from an undifferentiated flux. Bracketing and labeling are forms of simplification. Imposing labels trigger a particular kind of diagnostic treatment and will suggest modes of acting, managing, coordinating, etc. What is important for our purposes is to highlight that the way events are first envisioned begins the process: noticing, bracketing and labeling are efforts to reduce uncertainty and transience and begin to create order out of chaos; once events are bracketed and labeled, people are disposed to find ways to act. Following Weick et al. (2005):

In the context of everyday life, when people confront something unintelligible and ask "what's the story here?" their question has the force of bringing an event into existence. When people then ask "What do I do?" this question has the force of bringing meaning into existence, meaning that they hope is stable enough for them to act into the future, continue to act, and to have the sense that they remain in touch with the continuing flow of experience. (p. 410)

Most situations are routine and do not demand explicit sense-making or full attention. Under conditions of habit and routine, people rely upon prototypic cases, encouraging stable action. When peripheral cases arise that are equivocal, however, action becomes indeterminate and variable, candidates to change organization and adaptive patterns, and sense-making efforts are engaged. People attempt to grasp

fleeting meaning, continually revising an emerging story that gradually becomes comprehensive enough that it persists and is available as a resource for people to draw on in future sense-making efforts. What's important is to create and retain plausible stories. In DoD interventions, when people face uncertainty and look around for meaningful guides, they are likely to revert to familiar recipes and scripts that are consistent with bureaucratic and mechanistic routines, patterns that would undo edge-like ideals.

Also, in the DoD there may be a tendency for people to speak as if they are trying to get the story "right," perceiving events accurately (and in this case, perhaps interpreting the accuracy of legal constraints). However, sense-making efforts are not about discovering the "truth," for *truth* is constructed socially within most of the social domain associated with organizational change. Although asserting and obtaining agreement on some common version of "truth" may be an important factor for motivation, this approach fails to acknowledge the social construction of organizational reality, which rarely results in a common construction. Rather, sense-making efforts seek to create a *plausible story* (Weick et al., 2005). It is through such plausible stories that people interpret their environment, and the stories themselves become "truth"—often only implicitly—via social construction and agreement. Stories will be more plausible, especially in the early stages, when they link with prior stories, when events can be seen as exemplars of familiar principles and stories. Further, as these stories facilitate ongoing action, they become increasingly plausible. Hence, the process builds upon itself, until a large-scale organizational reality has been created through successive accretion of linked, plausible stories for making sense.

The notion that sense-making is directed toward plausibility rather than accuracy (Weick, 1995) conflicts with many academic theories, as well as the culture of the DoD. When attempting change in this case, it's important to realize that the climate of the DoD will be geared toward accuracy. Therefore, we would expect many of the early attempts at sense-making to be framed in terms of "correctness" and "accurate behaviors." Even though edge organizations offer multiple variants of

possible behaviors, few of them can be deemed “accurate” in advance of execution. Hence, accuracy as a driver for choice and behavior is a goal consistent with rational choice versions of human behavior, and we would expect this to assume a more salient theme during the engineering stage of change intervention. Alternatively, in the shorter-term phases of change toward Holonistic organizations, it’s important to appreciate that plausible stories keep things moving. This is why we argue below that large group interventions (LGIs) are appropriate for holonistic change. LGIs suspend routine solutions and encourage a proliferation of various narratives which then become candidates for plausible meaning-making long enough to guide actions, which in turn reinforce plausibility.

Disruption triggers and identity construction:

We examine now disruptions as triggers for sense-making. Since sense-making is the continual search for, and creation of, meaning and identity, we would expect to find explicit efforts at sense-making when the perceived world is significantly different from “world as expected.” Two types of sense-making occasions common to organization are ambiguity and uncertainty. The “shock” in each case is somewhat different. In the case of ambiguity, people engage in sense-making because they are confused by too many interpretations; whereas in the case of uncertainty, they do so because they are ignorant of any interpretations (Weick, 1995, pp. 91-92). We assume for purposes of the present study that DoD professionals will be working and acting under conditions of uncertainty, unclear of interpretations, and will search for various scripts and familiar narratives to make sense of events. They will draw upon past stories, past routines and institutionalized scripts to make sense of these aberrant events. One goal, then, of such interventions is to shift from uncertainty to ambiguity to create multiple narratives as guides to action.

Now we are equipped to examine identity construction. Identity construction is at the base of sense-making activities and undergirds the efforts to stabilize meaning: sense-makers are preoccupied with identity construction. Following Weick, “people learn about their identities by projecting them into an environment and

observing the consequences" (Weick, 1995). Shocks that threaten identity trigger attempts to construct a stable, positive, efficacious identity. When people confront an unexpected situation, such as the prospect of changing from bureaucratic to "edge-like," this will translate into identity questions; people will wonder who they are and what matters. As they act, they are likely to notice cues and triggers that enhance a sense of self efficacy. These stories help to frame the way people will commit to streams of actions.

Regarding social dynamics and sense-making, highlighting individual identity risks ignoring the social-relational nature of sense-making. Sense-making is a social activity. When unfamiliar contexts arise, people are likely to ask themselves whether the new situation is the same or different than prior situations. Multiple possible meanings become occasions for diagnosis and action strategies, attempts to reduce equivocality by seeking shared understanding. Actors will be faced with a dilemma of too many or too few possible meanings, and are likely to attend to how others frame, interpret, diagnose, and act.

As action unfolds, people's hunches become enmeshed with the task of seeking one another out for advice, looking for specialists to confirm an interpretation or to take action. Shared understandings of the "correct" action to take emerges through continual, iterative talk. Both talk and action are central to sense-making. Action creates more information and opportunities for negotiation and opportunities to increase one's sense of what is going on. Actions enable people to assess causal beliefs that subsequently lead to new actions undertaken to test the newly asserted relationships. Over time, as supporting evidence mounts, significant changes in beliefs and actions evolve (Weick et al., 2005, p. 416).

People will be testing hunches, experimenting, acting on "as if" beliefs, linking the concrete and personal with the abstract and impersonal. The question about what to do next will be linked to resistance as there is temptation to repeat familiar scripts. Scott (2003) maintains that organizations cannot be properly understood separate from their wider social and cultural contexts. Then, perhaps, if we were to

understand the change process within this context, we would need to account for wider institutional trends. What are the broader cognitive, normative and regulatory forces that impinge on actors? What agencies, professions, and interest groups do these actors confront? If no other groups within the DoD move toward edge-like structures, then these outside interpretations might trump any internal effort to re-interpret distributed decision making as effective organizing. It is probable that public discourse will aid in directing members' attention in setting agendas and framing issues in legalistic terms. Given this tendency, we are more convinced of the need for socializing interventions.

The Logic for Beginning with Socializing Interventions and Large-scale Change

Recall from above our discussion of Dunphy's components of change theory; we outline various elements of change. In the case of DoD acquisition organizations, we argue that we must appreciate the nature of the task and how it is likely to change. Under bureaucratic and legalistic norms, tasks are structured sequentially. Sequential interdependence requires minimal interaction. Actors can research procedures and rules with minimal need for interpretation. Re-allocating decision rights under holonistic norms of self organizing has implications for the structure of tasks. Under these conditions, we would expect more equivocality in acquisition requests, the need for more interpretation in order to attain understanding in considering action choices, and also social processes to understand consequences of action. Rules and regulations will no longer serve as the primary or exclusive form of constraint. Actors will negotiate meaning (and perhaps resources). In short, the tasks themselves will move from sequential to reciprocal interdependence. There will be greater need for scheduled and unscheduled meetings. Meetings and exchanges will not necessarily lead to clear decisions and actions, but will likely require further negotiation and meetings. Further, since actors will now live with repercussions of their own decisions, learning needs to continue to occur after a decision is made. Decision-makers will do more research and inquiry into short- and long-term consequences of decisions. Cultural norms and beliefs will gradually become guides

for action. New norms of responsibility will develop. There will be a temptation for actors to become more risk averse as personal responsibility increases and as the need for informed decisions based on well-grounded interpretation increases. In short, changing from mechanistic to holonistic forms of organizing is a disruption of several components; new forms of social relationships are required that involve participation and negotiation of multiple stakeholders to engage in sense-making activities. One socialization intervention that seems appropriate is the large group intervention. We now discuss the nature of large group interventions and discuss one in particular—the appreciative inquiry summit.

One of the most promising recent advances in the field of organizational development and change is the area of large-scale change. Traditional change techniques have focused on work with individuals and small groups. The field has moved to focus from micro organizational issues to macro, large-system issues. (In attempting major, second-order change of the type we are discussing here, it is questionable whether working at the small-group level can accomplish much).

A range of techniques and methods have evolved over the last decade, including search conference, future search, real-time strategic change, Simu-Real, whole-system design, fast-cycle full participation and appreciative inquiry summits. What these methods have in common is the focus on large groups of people simultaneously strategizing and creating change plans. Most of these methods assume that participants can shape and decide upon issues in the organization and its environment; most include a majority of organizational members and stakeholders. These methods are highly participative; divergent voices are included. Techniques are designed to help the organization be responsive and adaptive by providing ways to get the entire system to dialogue about the organizational situation and context. Dialogue between members leads to reframing; efforts are made to search for agreement for action strategies and cooperative effort to accomplish agreed-upon goals. These techniques promise to implement change with greater speed than traditional techniques. In most of these models, change agents/consultants act as facilitators. The appreciative inquiry summit is one large-

scale change intervention and follows Weisbord's (1992) dictum to "get the whole system in the room."

The Appreciative Inquiry (AI) Summit involves a broad range of internal and external stakeholders in the process. It involves commanding interventions and a steering committee to name the strategic topic that focuses the change efforts. In the case of transforming a DoD acquisition organization, we would assume that the strategic topic would need to account for customer requirements in terms of speed and efficiency; the need to empower workers at all levels to respond to customer needs with a minimum of regulatory requirements. Since the goal is to involve the entire system if possible, numerous stakeholders would be invited—including suppliers, customers, representatives from every rank and function (relationship intervention).

It typically begins with a single event or series of events (usually 3-5 days in length) that bring people together to: 1) discover the organization or community's core competencies and strengths; 2) envision opportunities for positive change; 3) design the desired changes into the organization or community's systems, structures, strategies, and culture; and 4) implement and sustain the changes and make them work through changes in work processes (engineering interventions). AI Summits range from 30 to 3000 people and can include more using online technology. Because of the power of wholeness and democratic self-organizing, the closer Summits get to including every member of the system, the more dramatic and sustainable the impact.

Advocates of summits claim that they tend to engender commitment and follow through. Summits are designed to maximize wholeness, strategic visioning, learning, and relating. They require large, arena-type spaces with groups of eight to ten diverse participants. Everyone helps address tasks while taking responsibility for their own utterances, actions, perceptions, and feelings. Members do not stay in the same groups for the entire summit, but assemble into various stakeholder groups—departmental groupings, customers, suppliers, and others. Although each AI Summit

is unique, all are designed to flow through the appreciative inquiry 4-D cycle of discovery, dream, design, and destiny.

Day 1: Discovery—discovering and connecting the many facets of the organization's "positive core": the strengths, assets, competencies, capabilities, values, traditions, wisdoms, and potentials that fuel and sustain its success.

Day 2: Dream—envisioning the organization's future in bold and specific terms.

Day 3: Design—designing the "social architecture" (e.g., strategies, structures, systems, culture, processes, partnerships) to give form to members' dreams.

Day 4: Destiny—planning for action and change in work processes. Individual commitments are made, innovation teams formed, strategic initiatives launched, and large-group dialogue promotes organizational alignment. Additionally, the next steps in the change process are launched. Essentially, these are engineering interventions.

Large group interventions (specifically AI summits) are good enablers for major change required to move to holonistic organizations because they: increase facility in sense-making by providing opportunities for divergent stakeholders to share perspectives, suspend habitual recipes for actions, invite various narratives and scenarios that become candidates for plausible guides for actions, invite people to experiment with new actions, provide positive images for possible action, encourage an action orientation so that people can begin with action first (followed by belief and understanding), encourage people to make public commitments to new actions making it harder to revert to previous comfortable patterns, create arenas for people to discover areas of agreement rather than replay old conflicts, invite people to take a holistic, systemic perspective so that sub-optimization is discouraged.

The large group intervention is an appropriate model for change because: 1) it models edge-like organizational structures of guided autonomy within a controlled

space; 2) it invites multiple stakeholders and voices, including voices exogenous to the organization (such as customers) to jointly create narratives, meaning, and consider identity transformation; 3) the joint meaning and definitions that emerge from large group interventions become the ground from which engineering interventions then become appropriate; 4) LGIs build on the positive and invite sense-making that builds on the positive factors in the past and facilitates possible actions into the future.

Computational Experimentation

The first step in developing computational models of the change process is ontological: members must identify what aspects of the world will exist representationally in the model. The VDT modeling suite comes equipped with an explicit representational ontology, so this step becomes more one of mapping than of creation. Specifically, we map the kinds of organizational and processual considerations discussed above onto the VDT modeling suite. The key comparison we seek to examine through computational models is between the kinds of command- and engineering-first approaches to change—which we note above are common in the DoD—and the kinds of socialization-first approach instantiated through large group interventions. The former falls relatively close to the types of organizations and processes that have been modeled to date via VDT, so we begin there. We leave models of the latter to our future research agenda. Here, we describe a preliminary model of one change process described above: command-first change. We then discuss some insightful manipulations of this model, and close with comments linking back to the findings above.

Command-First Model

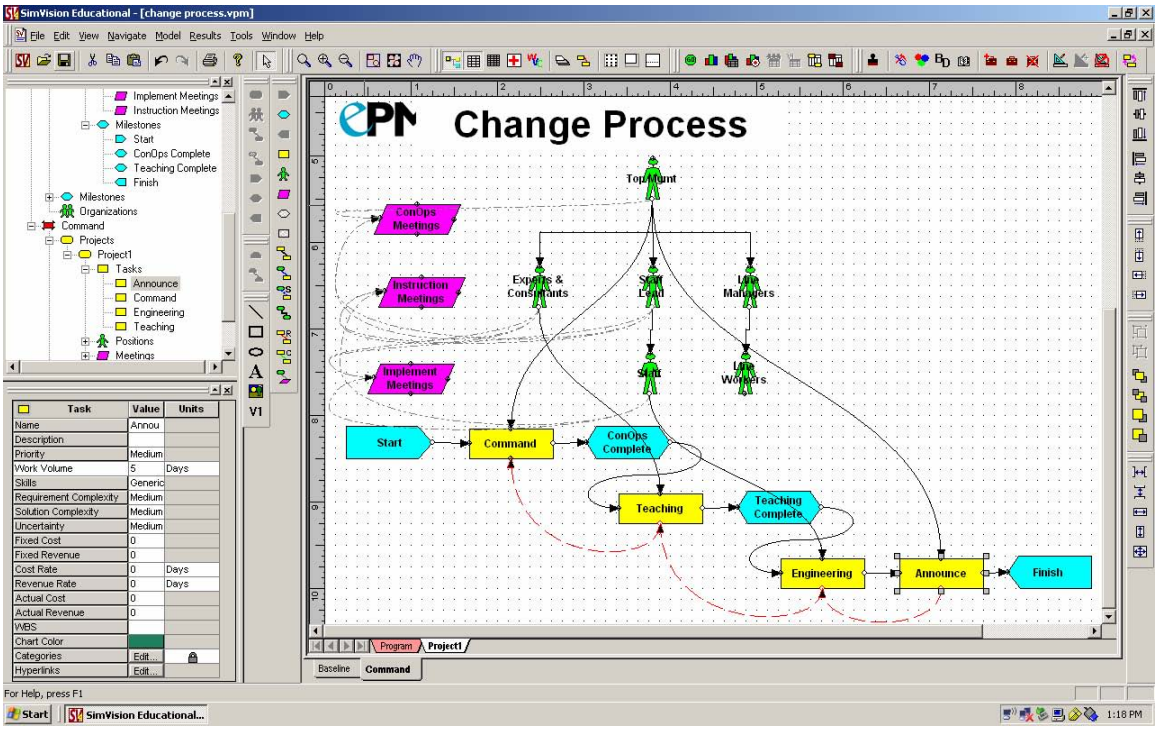

Figure 1. SimVision Change Process Diagram

Figure 1 delineates a screendump from SimVision, a commercial implementation of the VDT modeling tool set, which depicts the organizational structure and task structure associated with a command-first change process. The green person icons represent the organization structure, with Top Management at the top. In the case of acquisition organizations, Top Management would likely consist of the Service Acquisition Executive (SAE) and multiple Program Executive Officers (PEOs). In this model, we include four PEOs to work as a top-management team with the SAE. Although these leaders have considerable skill and application experience in *acquisition*, we presume that their skill and application experience in *large scale change* is minimal. Alternatively, reporting to this top-management team is a small team of (5) experts and consultants with comparatively high skill and application experience in *large scale change*. Such experts and consultants are brought in for their change-management expertise, and they serve to drive much of the change effort. Reporting to this top-management team also is a Staff Lead, who is in charge of a relatively small team of (10) workers who perform most of the

considerable staff work associated with the change process. A team of (10) line-project managers report to the top-management team also, but their focus is on day-to-day, operational project activities, not the change process per se. We include them here for reference, along with a relatively large team of (1000) project workers, who likewise focus on operational activities, not process change. In this scheme, the hierarchical lines of authority also depict the lines of communication and decision-making for the change process.

The yellow boxes depict work activities associated with the change process. We include four activities—command, teaching, engineering and announcement—arranged sequentially, and interspersed between two milestone events—ConOps Complete and Teaching Complete—that denote both progress and transition between phases of the change process. For instance, the Teaching activity does not begin until after the Command activity is complete, the latter of which is signaled by the ConOps Complete milestone. Likewise, the Engineering activity does not begin until after the Teaching activity is complete and the Teaching Complete milestone is reached. The Announcement activity follows completion of the Engineering activity in turn, and represents the final activity before the change process is (deemed) complete.

Each activity is specified with a value for *work volume*, which quantifies the level of effort required generally for adequately skilled actors to complete. The values specified for the four activities are 50, 50, 1000 and 5 person-days, respectively. In the case of Command, for instance, the 50 person-days would be accomplished by a team of five, competent, Top Management actors in roughly ten workdays (i.e., 50 person-days divided by 5 actors equals 10 days). The same applies to the other activities. The red links between the activities depict rework. As exceptions are encountered with the Teaching activity, for instance, this implies that some aspects (roughly 10%) of the Command activity must be redone. It is likewise the case for exceptions encountered in the Engineering and Announcement activities, which impact Teaching and Engineering, respectively. Dark-blue lines from

the actors to the activities depict primary task responsibilities, and, hence, link the organization structure with the task structure.

The three magenta trapezoid shapes depict standing meetings that require participation by various organizational actors over specified periods of time. First, the ConOps Meetings take place two hours each week—and involve Top Management, Experts & Consultants and Staff Lead—from project start through the end of Command activities (i.e., the ConOps Complete milestone). These meetings are driven by Top Management and focus on the nature of change envisioned for the organization; participation is limited to this relatively small team of senior leaders and staff members.

Second, the Instruction Meetings take place two hours each day from ConOps Complete through the end of Teaching activities (i.e., the Teaching Complete milestone). These meetings are driven by Experts & Consultants and focus on how to transform the organization; participation is limited to Experts, Consultants, Staff Lead and Staff. Third, the Implementation Meetings take place two hours each week from Teaching Complete through the end of Engineering and Announcement activities (i.e., the Finish milestone). These meetings are driven by Staff and focus on redesigning the organization's work processes in detail; participation is limited to Experts, Consultants, Staff Lead and Staff. Notice that Line Managers and Workers do not get involved directly in this change process. However, their various organizations are represented by temporary membership on the Staff involved with the change process. This model provides us with the ability to examine and specify the change organization in considerable detail.

This model provides us also with the ability to simulate the performance of this change organization across an array of measures. A select set of performance measures and simulated values is summarized in Table 2 for this command-first model of change. The duration measure (350 days) quantifies the elapsed time for completion of the change process activities that are depicted in the model. Hence, our performance emulation suggests that nearly one calendar year would be

required for the four activities represented in this command-first change process. Notice this excludes the subsequent time and effort required for the organization itself to change; that is, here we model the process of *planning for change*, but we exclude the process of *implementing change*, the latter of which will likely dwarf the former in terms of time, cost and risk. It remains for future research to develop such latter model, as we can take only one step at a time in this exploratory effort.

Table 2. Simulated Performance

Measure	Command
Duration	350 days
Cost	$245K
Work Volume	1105 P-days
Rework	298 P-days
Coordination	275 P-days
Wait	16 P-days
Project Risk	.343
Backlog	11 days (Staff)

The cost measure ($245K) indicates that roughly a quarter million dollars would be required to complete this change process. This figure is likely to be biased low, but we would need to calibrate the model to compensate in an informed manner. Such calibration remains for future research also. But even before calibration, because costs are simulated in the same way across different models, we would be able to evaluate comparative costs between alternate change processes (e.g., change-first vs. socialization-first). The same applies to all simulated performance measures. Indeed, the computational model enables precise control over which specific variables are changed between any one model and another, so comparative performance measures such as duration and cost can be very informative.

The next four measures listed in the table all have the same units of person-days (P-days), which represent the number of actors multiplied by the number of days they are involved in an activity. For instance, if ten actors work for one day on a particular task, this would represent 10 P-days. As noted above, Work Volume represents the amount of effort that would be required by adequately competent actors performing all of the change-process activities. The 1105 P-days indicate nearly three person-years of effort, and all values (e.g., Duration, Work Volume, others) exclude time off for evenings, weekends, holidays and other planned non-working periods. The Rework measure quantifies the level of work associated with correcting problems caused by exceptions. At 298 P-days, Rework amounts to more than a quarter of the Work Volume. Coordination pertains to time and effort required to plan, interact and monitor the change process, which includes time spent in meetings, asking questions, and providing answers. At 275 P-days, the coordination effort is sizeable, nearly equaling that of Rework, and indicating that coordination amounts to nearly a quarter of the Work Volume. The Wait measure estimates the time spent by subordinates waiting for superiors to make decisions and provide guidance and answers that are needed. At 16 P-days, workers do not spend very much time waiting, comparatively.

Project risk assesses the fraction of exceptions that are not addressed completely or not addressed at all. Clearly not all project exceptions need to be addressed, but the more exceptions that are left unaddressed, or are unaddressed completely, the greater the chance of a major issue afflicting the change process. Hence, this measure quantifies the relative effort that would have to be expended—over and above that contributing to the work, coordination, cost and duration discussed above—to remedy all of the exceptions encountered through the change process. The value (0.343) is substantial but not uncommon. Were we to include change-process implementation in addition to the planning effort above, this value would increase appreciably no doubt. Finally, Backlog measures the maximum number of days' work queued up in the in-box of a particular actor. The 11 days shown in the table (for the Staff actor) indicates that the change-process staff fall 11 days behind at the highest point (during the Engineering activities). Backlog can be

an excellent predictor of project exceptions and risk, as it highlights bottlenecks in the process.

Although such performance measures have some merit on their own (they reveal a diversity of performance aspects associated with the modeled change process), their principal value derives from *comparison* between alternate change processes. For instance, when we develop a model of the change process associated with large group intervention (e.g., Appreciative Inquiry Summit), we will be able to compare its relative performance with that of the command-first model across this array of dependent variables. This remains for future research as well.

Insightful Manipulations

The VDT modeling tool set implemented via SimVision includes nearly a hundred different parameters—each driven by Organization Theory and validated empirically—which can be varied to specify different organizations and environments. We discuss two here that offer insight into how changes in organizational climate and environment can affect performance of the change process: 1) noise and 2) experience.

First, the Noise parameter captures effects of the organizational environment that are associated with interruptions. Such effects can include unsolicited telephone calls, informational requests from co-workers, non-job-related conversations, requirements to attend meetings outside the task focus of actors, demands to perform activities that draw actors away from their primary project tasks, travel periods and like factors, in addition to organizational difficulties in terms of communications (e.g., unclear, equivocal, or conflicting directions). A change organization that is relatively “quiet” would have a lower noise parameter setting than one that is relatively “loud,” for instance. The setting for our command-first organization described above is 0.2, which represents the kind of relatively hectic and equivocal organizational environment associated generally with an *acquisition* organization, but it may be entirely too low for the kind of *change* organization modeled here, particularly if the organization does not undergo transformational

change frequently. Hence, we specify a higher noise level of 0.4 to provide insight into the effect of noise. Table 3 includes a third column to summarize the noise effect and provides the values from Table 2 above for direct comparison. All other aspects of the model delineated in Figure 1 and summarized in Table 2 above remain unchanged.

Table 3. Noise & Knowledge Effects

Measure	Command	Noise	Experience
Duration	350 days	354 days	**303 days**
Cost	$245K	$250K	**$208K**
Work Volume	1105 P-days	1105 P-days	1105 P-days
Rework	298 P-days	**360 P-days**	317 P-days
Coordination	275 P-days	282 P-days	**249 P-days**
Wait	16 P-days	20 P-days	19 P-days
Project Risk	.343	**.374**	**.305**
Backlog	11 days (Staff)	11 days (Staff)	11 days (Staff)

Notice that most of the performance measures do not change appreciably between our baseline, command-first values summarized in Column 2 and those corresponding to the higher noise environment summarized in Column 3. Indeed, the increased noise level has negligible impact on Duration (4 additional days), Cost ($5K), Work Volume (no impact), Coordination (7 P-days), Wait time (4 P-days) and Backlog (no impact). Alternatively, the impacts on Rework (21%) and Risk (9%) are sizeable. This provides insight into how top management can influence the work environment in a negative manner simply by allowing interruptions to grow. It provides insight also into the kinds of performance measures (e.g., rework and risk) that are relatively sensitive to noise.

Table 3 includes a fourth column also to summarize the experience effect. As above, all other aspects of the model delineated in Figure 1 and summarized in Table 2 above remain unchanged. The Application Experience parameter represents

the level of experience that certain organizational actors have in a particular application domain. In this case, we modify the experience levels of the Top Management team only, increasing its Application Experience level one step, from Low to Medium. This represents the level of experience the top-management team has with organizational change, with Low reflecting minimal experience, and Medium reflecting some prior experience. This represents a top-management team that has been involved with previous change processes, in addition to possessing acquisition experience. In contrast to these top-management settings, the Experts & Consultants actors have Application Experience set to the level High across all models; this is why they are called “experts” and are hired as consultants.

As above, it is worth noting that most of the performance measures do not change appreciably between our baseline, command-first values summarized in Column 2 and those corresponding to the higher-experience actors summarized in Column 4. Alternatively, both the Duration (303 days) and Cost ($208K) measures are down appreciably, as are Coordination (249 P-days) and Risk (0.305). Notice also that the performance areas of change associated with increased experience (e.g., Duration, Cost, Coordination) differ from those affected by increased noise (e.g., Rework), and that experience has an effect on Risk that is opposite to that of noise (i.e., decrease to 0.305 vs. increase to 0.374). Intuitively, more knowledgeable top managers have a positive effect on the change process, and a noisier environment has a negative effect. Beyond mere intuition, however, using computational models such as this enables us to *quantify* the effects of such intuition. This can be very powerful.

Linkages to Findings

The computational model described above captures several elements from our findings in this study, and represents them in a semi-formal manner—one which makes explicit the various assumptions pertaining to the change process (e.g., number of participants, skill levels, noise and experience), and which can reproduce results reliably from one simulation to the next, regardless of who runs the model. This provides an unprecedented level of precision in terms of describing and

communicating about change processes, and it enables us to both quantify and compare the relative performance of alternate approaches to change—*before committing to one approach versus another*. This offers the potential to revolutionize change management in the acquisition domain.

This computational model also draws directly from the qualitative study above, instantiating the top-down, relatively noisy, hierarchical environment described by the acquisition professionals interviewed. This provides a degree of representational validity to the model, and it provides the ability to represent computationally the kinds of factors described by acquisition professionals. The computational model draws directly from the theoretical study above also, instantiating the command-first, sequential, small-group intervention process ascribed to most DoD change processes. As above, this provides a degree of theoretical grounding to the model, and it provides the ability to represent computationally the kinds of factors described by theory.

However, some important, empirical factors (such as *risk aversion, change for change's sake,* and *optimism*) are not represented well by this model. Likewise, some important theoretical factors (such as *sense-making, identify formation* and *resistance to change*) are not represented well by this model, either. Hence, we must be selective about which factors and effects to assess via computational models, and which will require alternate means of evaluation. We must also endeavor to continue this exploratory research, perhaps enriching the ontology of the VDT tool set to represent such important empirical and theoretical factors. This provides a segue to our agenda for future research.

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Conclusion

The DoD is a large, bureaucratic, rule-intensive organization that may no longer be best suited for its new environment. Building upon prior research on acquisition centralization, knowledge dynamics and organizational design, we draw upon the best knowledge and practice in change management (e.g., including Models of Planned Change, Change Typologies and Planning the Flow of intervention types, Intervention Models within DoD, Sense-making as a tool to understand change processes, and the Logic for beginning with socializing interventions and Large Scale Change), and analyze transformation from the classic Hierarchy to radical, alternate organizational forms such as the Edge-like Holonistic organization identified through prior research as offering excellent potential to improve the performance of Defense acquisition organizations.

Such analysis focuses on the processes of change from one organizational form to another, and leads to the generation of transformational plans—involving both radical and incremental means—which can be used by acquisition leaders, practitioners and policy makers to outline steps—and leaps—required to affect fundamental organizational change. In particular, we argue how the traditional DoD, command-first, approach to change suffers from great limitations when large-scale transformation is desired, and that such large-scale transformations are required to move from the current Hierarchy to Edge-like Holonistic organizations.

Alternatively, to overcome the stubborn nature of the DoD Bureaucracy and to affect the strong, persistent collective identity of acquisition professionals, different, socialization-first, large group interventions such as the Appreciative Inquiry Summit are called for. This represents a key result for the acquisition leader and policy maker: *The process of organizational change cannot be managed in the same way that the process of acquisition management is*. Change is different from acquisition. It should be no surprise that the management of change should differ from the management of acquisition.

We also build upon prior work on computational modeling and experimentation to develop models of the transformation process, and we explore such models to emulate the behavior of the alternate transformational plans noted above. By modeling and experimenting with processes of change, as opposed to processes of ongoing organizational routines, we begin to extend the state-of-the-art in computational modeling and experimentation. Although our exploratory modeling work represents only a relatively small step in this direction, we illustrate how even elusive change processes can be modeled with both representational validity and theoretical grounding, and we provide insight into the kinds of controllable factors that influence the performance of change processes: *environmental noise impedes change,* and *application experience of top managers promotes change*. Although such insight is consistent with intuition, we possess now the ability to quantify such intuition, and to compare the relative performance of myriad, diverse, alternate approaches to organizational change. This opens up a whole new way to plan and execute organizational change in acquisition.

Clearly, additional research along the lines of this investigation is called for. Additional qualitative work can uncover even deeper insights into the indicators and nature of change in acquisition, for example, and additional theoretical work can identify even more generalizable guidelines for approaching planned change. Theoretical work can also serve to guide additional qualitative studies, and qualitative work can, likewise, inform additional theoretical studies. Both qualitative and theoretical work can guide and inform additional computational modeling, and computational modeling work can both guide and inform additional qualitative and theoretical research. This integrated, three-part research approach of ours—one which places theoretical study at the fulcrum to balance qualitative fieldwork with computational experimentation—offers huge advantage in terms of triangulation, and we show already how results can inform the acquisition leader and policy maker today, as well as guide the acquisition researcher tomorrow.

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